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OPEC'S TERMS OF TRADE: A COMPARISON OF THE SEVENTIES WITH THE EIGHTIES

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INTRODUCTION

The history of the Organization of the Petroleum Exporting Countries, OPEC, contains numerous surprises. When it was founded in 1960, little attention was given to its existence. At that time, OPEC was almost powerless relative to the giant multinational oil companies with which it negotiated. In addition, there was mistrust among OPEC members, and there was international opposition to the existence of OPEC and its operation as a cartel.

This weak position slowly reversed. Between 1960 and the early 1970's the demand for oil, relative to supply, increased sharply. As a result of the Arab oil embargo, other countries began to realize the cartel's power. Thereafter, until the early 1980's, the cartel enjoyed historic and unprecedented success. In 1980 few believed that the cartel would be weakened in the foreseeable future. Then came the sharp increase in supply that caused the price of oil to drop, weakening the cartel.

The rise and decline of the OPEC were not predicted, at least at the times when they happened. Some economists, basing their proposition on the theory and history of cartels, anticipated the fall of OPEC under several conditions.[1] These conditions were met in the early 1980's and OPEC's tremendous power began to diminish. The weakness of OPEC measured by the downward trend of the prices of oil started in 1983.

The nominal price of crude oil and annual percentage changes are shown in Figures 1, and 2, and Table 1.[2] These data show that from 1970 to 1982 the nominal price of oil increased every year. The sharpest price increase, over 261 percent, occurred in 1974. Between 1983 and 1988 prices declined each year except in 1987. The sharpest decline was in 1986 when prices fell by over 48 percent. The table and figures show the upward trend of oil prices and rising cartel power between 1970 to 1982, and the downward trend thereafter.

As OPEC oil is priced in United States dollars, changes in the exchange rate of the dollar against other currencies have an impact on the purchasing power of OPEC members vis-á-vis other countries whose currencies appreciated, and a strong dollar does the opposite.

In the early seventies, before the Arab oil embargo and the full realization of OPEC's power as a strong cartel occurred, OPEC negotiated a collective agreement with the multinational oil companies to offset the effect of the weak dollar against an arithmetical average of a basket of nine major currencies: The German mark, the Japanese yen, the Belgian, Swiss and French francs, the British pound, the Italian lira, the Netherlands guilder, and the Swedish kroner. This basket was called the Geneva I basket.

Later on, in 1973, OPEC and the oil companies agreed to amend the Geneva I basket by adding two more currencies. This new currency composite, consisting of the nine currencies of the Geneva I basket plus the Australian and the Canadian dollar, was called the Geneva II basket. But later, when OPEC consolidated its full cartel power, it unilaterally raised the price of oil without official link to currency or currency basket.

This research attempts to: (1) measure the impact of changes in the value of the dollar vis-á-vis other currencies on the purchasing power of OPEC members for 1970 to 1989. Four different measures (the Geneva I, the Geneva II, a trade weighted basket and the Special Drawing Right (SDR) of the International Monetary Fund (IMF) are used for this purpose; (2) calculate an inflationary measure applicable to OPEC as a trade-weighted average of the export price index of industrial countries; and (3) combine these two measures with the changes in the prices of crude oil to calculate the terms of trade of OPEC with the industrial countries.

The terms of trade, and each of its variables individually, reflect the economic gains or losses to OPEC members.[3] The magnitude of these gains or losses over time, as measured by different criteria, are important to policy makers, investors, importers, and public in general in OPEC and industrial nations.

The results of this study suggests that the terms of trade of OPEC in the seventies improved significantly, while in the eighties it declined. We first introduce

Figure 1
Price of OPEC Oil

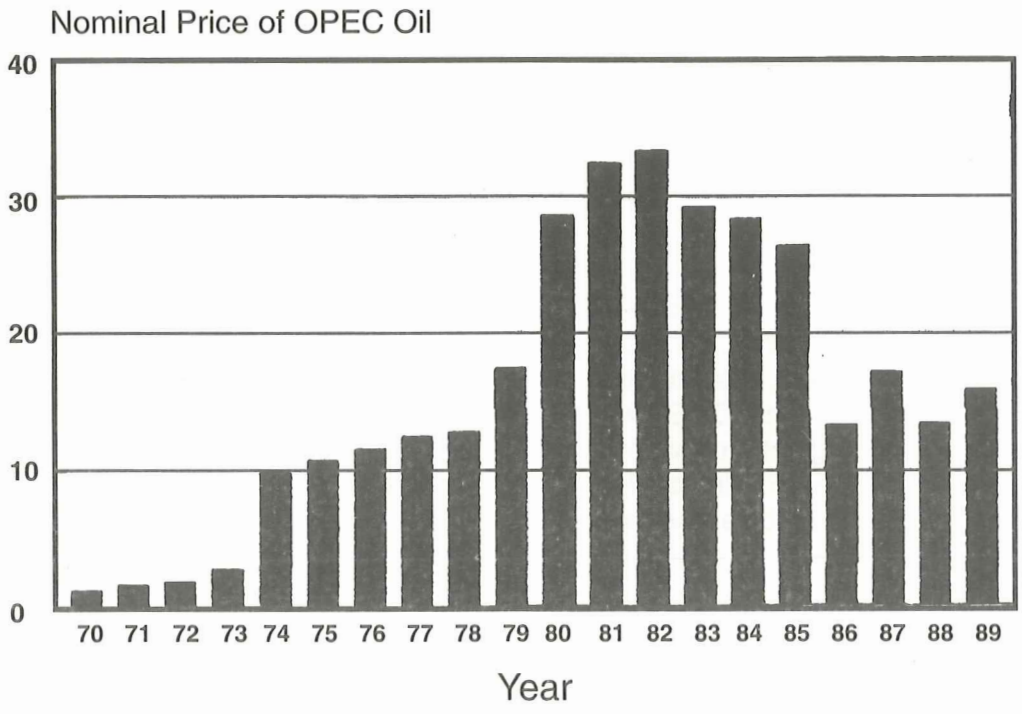
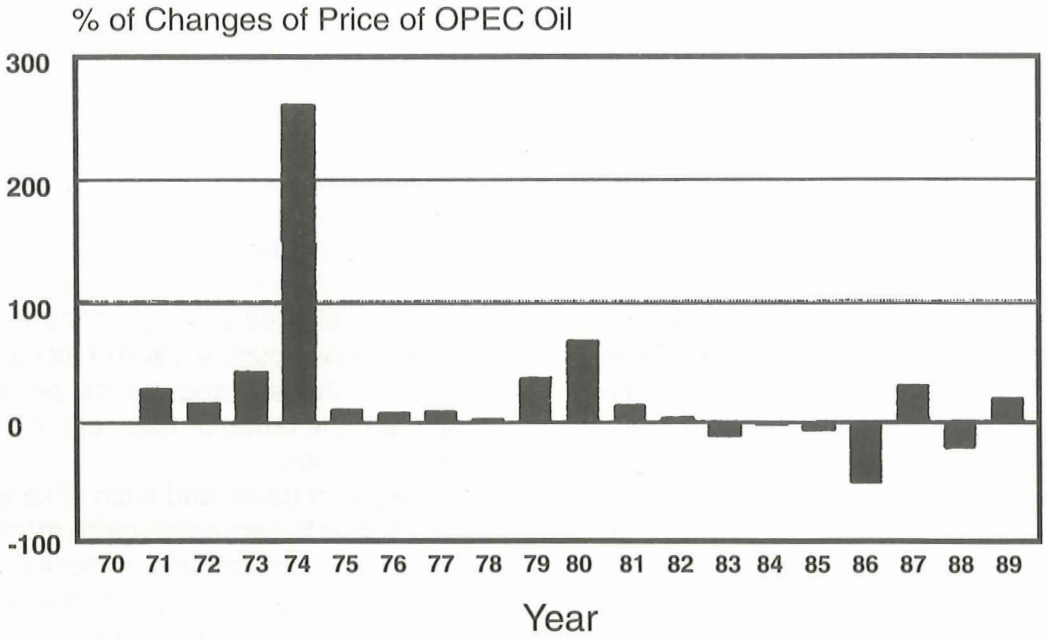


Figure 2
Percent of Changes of Price of OPEC Oil



1970 to 1984: Price of Saudi Arabian
1985 to 1989: Price of Dubai Bench Mark

Table 1

Price of OPEC Oil,
Value of the U. S. Dollar by Different Baskets
Measures, and Trade Weighted Export Price Index: 1970-89

Year	Price of OPEC Oil		Value of the Dollar in Terms of 4 Baskets (%)1				Trade Weighted EPI	
	U.S.$	% Chge	Gen I	Gen II	Trade	SDR	% Change	EPI
70	$1.30	---	-0.03	-0.30	0.18	0.00	4.77	104.77
71	1.65	26.92	-2.45	-2.22	-1.34	-0.30	5.54	110.57
72	1.90	15.15	-8.04	-6.29	-5.94	-7.62	9.30	120.85
73	2.70	42.11	-9.56	-5.97	-6.43	-8.93	19.17	144.02
74	9.76	261.48	2.28	1.78	3.65	-0.87	24.11	178.74
75	10.72	9.84	7.25	5.47	10.83	-0.95	11.03	198.46
76	11.51	7.37	1.56	0.41	0.31	5.17	-0.89	196.69
77	12.40	7.73	-2.45	-2.15	-2.29	-1.11	9.35	215.08
78	12.70	2.42	-11.46	-8.42	-9.66	-6.75	14.70	246.70
79	17.26	35.91	-5.36	-4.36	-2.84	-3.10	14.53	282.55
80	28.67	66.11	-0.61	-0.34	0.04	-0.73	13.36	320.30
81	32.50	13.36	20.78	17.31	13.96	10.38	-2.59	312.00
82	33.47	2.98	14.84	11.36	11.19	6.81	-3.67	300.55
83	29.31	-12.43	9.83	7.00	5.33	3.27	-3.03	291.44
84	28.47	-2.87	11.18	9.38	7.95	4.29	-2.66	283.69
85	26.46	-7.06	3.70	1.67	2.76	0.95	-0.08	283.46
86	13.08	-50.57	-23.01	-19.05	-18.78	-13.45	16.15	329.24
87	16.94	29.51	-14.45	-11.83	-11.10	-9.27	11.53	367.20
88	13.22	-21.96	-3.41	-2.36	-3.71	-3.78	6.31	390.37
89	15.70	18.76	7.44	5.84	5.85	4.85	-0.19	389.63
C.S.[2]		444.76	-1.97	-3.07	-0.04	-21.14	146.74	
Avg	15.99	22.24	-0.10	-0.15	0.00	-1.06	7.34	
S.D.	10.26	-35.83	10.20	8.12	7.93	5.87	8.06	

1. The Geneva I basket consists of the currencies of Japan, Germany, France, U.K, Belgium, Italy, Netherlands, Switzerland, and Sweden; all currencies have equal weights. The Geneva II basket consists of the currencies of the Geneva I, plus the Australian and the Canadian dollar; all currencies have equal weights. The Trade basket consists of the currencies of the U.S., Japan, Germany, U.K., France, Italy , Netherlands, Belgium, and Denmark; their weights are proportional to their exports to OPEC. SDR baskets consists of 16 currencies of major countries for 1974-80, and 5 currencies of U.S., Japan, Germany, U.K., and France since 1980; their wights are proportional with the size of each country's size of trade in the world.

2. C.S. = Cumulative Sum; Avg = Annual average; S.D. = Standard Deviation.

the methodology of calculating the variables of the terms of trade.

THE MODEL

In this section, the methodologies for measuring changes in the price of the U.S. dollar against other currencies, changes in the prices of imports to OPEC from industrial nations, and of the terms of trade are presented.

Model of the Impact of the Strength of the Dollar

It is required to identify currencies and their weights that should be used to measure the impact of the changes in the exchange rate on the purchasing power and terms of trade of OPEC. Four different currency baskets are used for this purpose.

Generally, to measure the effect of the value of the dollar against other currencies, assume E_i, represents the exchange rate of country i's currency in terms of the U.S. dollar. The annual percentage change of each currency in the basket, $\%DE_i$, can be calculated by

$$\%DE_i = (E_{il} - E_{i0}) * 100 / E_{i0} \bullet \quad (1)$$

where i = 1, 2, 3,.....n, and represents the number of currencies in the basket.

The annual average changes in the exchange rate of N currencies again the dollar as a currency basket measure is

$$\%D\ (Bkt) = \sum_{i=0}^{N} \%DE_i / N \quad (2)$$

In equation (2) E_i represents the exchange rates of the dollar against nine currencies in the Geneva I basket (N=11).

The third composite, called the trade basket, is adapted to measure the impact of the changes in the value of the dollar in terms of other currencies and is based on the relative size of OPEC's trade with the industrial nations. The trade basket is, therefore, a weighted average of the changes in exchange rates. The highest weight is assigned to the country with the highest exports to OPEC, and the lowest weight is assigned to the country with the lowest exports to OPEC. Accordingly, the trade basket consists of nine currencies of the United States, Japan, Belgium, Denmark, France, Germany, Great Britain, Italy and the Netherlands. Thus, the trade basket can be measured as follows:

$$\%D\ (Trd\text{-}Bkt) = \sum_{i=0}^{N} (Exp_i / T\text{-}Exp) * \%DE_i \quad (3)$$

Here Trd-Bkt is the trade basket measure, D represents the annual percentage change, Exp is exports from each industrial nations to OPEC, and T-Exp is the total exports from all industrial nations to OPEC. According to this basket, the changes in the value of the dollar are adjusted by the relative exports of each industrial nation to OPEC.

Finally, the changes in the special Drawing Rights (SDR) basket is simply the percentage changes in the SDR as follows:[4]

$$\%D\ (SDR\text{-}Bkt) = (SDR_1 - SDR_0) * 100 / SDR_0 \quad (4)$$

Model of the Inflationary Impact

The second factor which affects the terms of trade of OPEC is the inflationary impact on OPEC imports. A weighted average composite of the export price indices, EPI, from the industrial countries is used. That is,

$$II = \sum_{i=1}^{N} (1 - EP_{Ii+1}/EPI_i) \times (Exp_i/T\text{-}Exp) \quad (5)$$

II is the weighted average of the changes in the export price index and Exp is the value of exports of each industrial country to OPEC, and T-Exp is the value of the total exports of those countries to OPEC.

Model of the Terms of Trade

Based on these four different basket measures, the changes in the terms of trade of OPEC is measured as follows:

$$\%D\ (TOT) = \%DP - \%D\ (Bkt) - D(II) \quad (6)$$

Again %D represents the annual percentage change, TOTO is the terms of trade, P is the price of OPEC's crude oil, Bkt is the value of the dollar against each of those four basket of currencies, and II is the trade-weighted average of the changes in the export price index of the nine major industrial countries.

RESULTS OF THE MEASUREMENTS

Measurement of the Strength of the Dollar

From equation 2, changes in the value of the dollar in terms of the Geneva I are calculated and their results shown in Table 1 and Figure 3.

Accordingly, in the early 1970's the purchasing power of OPEC, in terms of the currencies in this composite, declined by over nine percent due to the weakness of the American dollar. Between 1974 and 1976, the trend was reversed in favor of OPEC. From 1977 to 1980, the dollar again showed weakness. Suddenly in 1981 the dollar strengthened by over 20 percent relative to the currencies of this basket, and that positive trend continued until 1985. Starting in 1986, the dollar declined significantly by 23 percent, remaining weak throughout 1988. In 1989, the dollar gained by over seven percent. The cumulative sum of this basket for 1970 to 1989 shows a total loss of 1.97 percent, an annual average loss of 0.10 percent, and a standard deviation of 10.20 percent.

Similarly, from equation 2, the impact of the changes of the value of the dollar according to the Geneva II basket are measured and their results are shown in Table 1. The path of this measure followed very closely that of the Geneva I composite. Comparing these two, it can be seen that the signs of changes in their values are all the same.

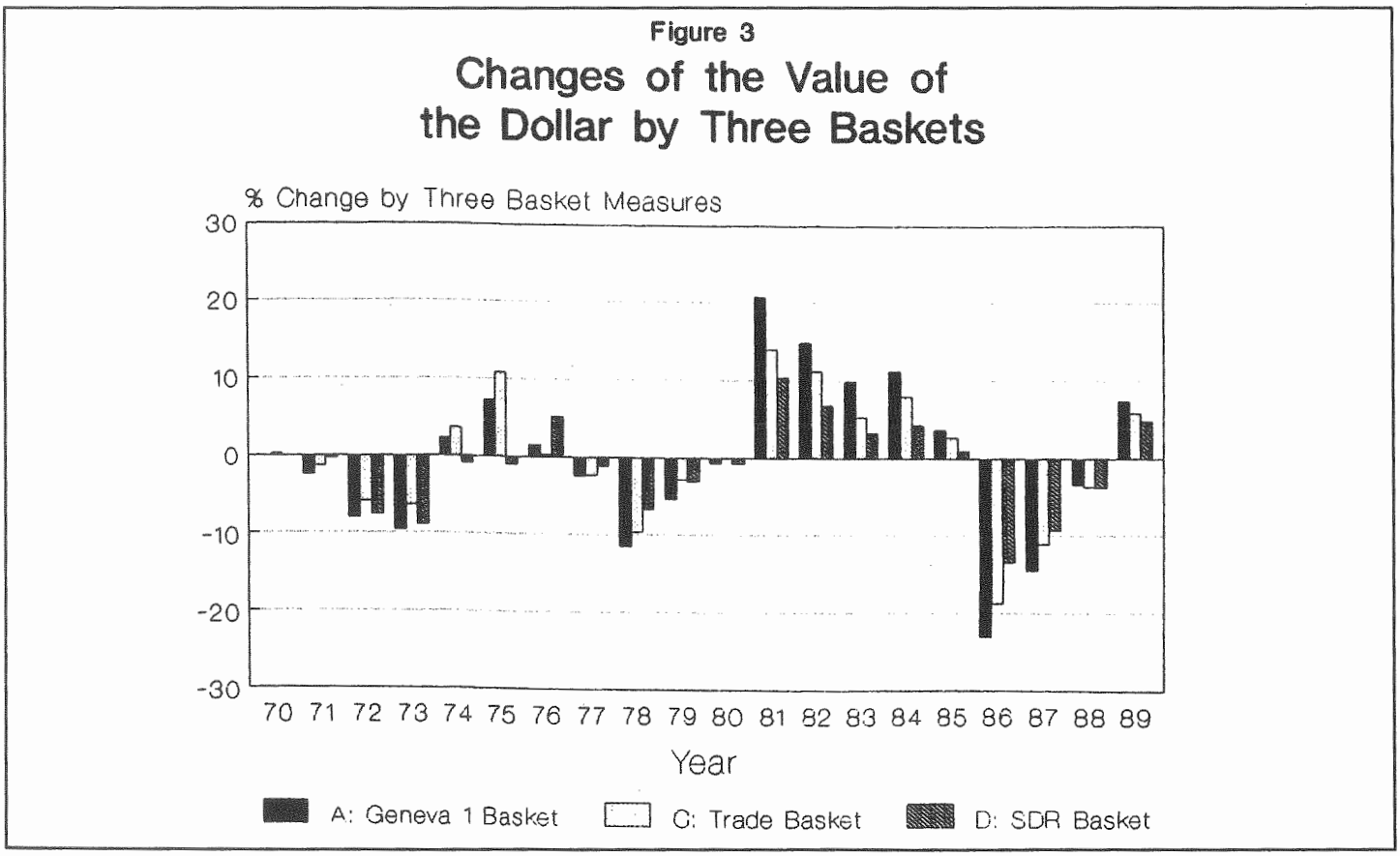
The major difference between these two baskets is that the Geneva II basket exhibits less volatility of value, with a standard deviation of 8.12 percent compared to 10.20 percent for the Geneva I measure. This difference is due to the fact that the Geneva II has two more currencies than the Geneva I. However, the Geneva II shows a larger cumulative loss of 3.07 percent compare to a loss of 1.97 percent for the Geneva I.

From equation 3, the trade currency composite are measured and shown in Table 1 and Figure 3. Again, the value of this basket followed those of the Geneva I and Geneva II, with the same signs of movements, with the exceptions of 1970 and 1980. In these two years the trade basket showed a strong dollar and gains for OPEC, whereas those of the other two baskets showed a weak dollar and thus losses to OPEC.

For the whole period, the average changes of the value of this basket were almost zero, with a standard deviation of 7.93 percent. Again, the difference between this basket and the Geneva I and the Geneva II is due to the differences of currencies and weights in these baskets. While the dollar is included in the trade basket and with the highest weight, it is not included in the other two baskets.

Finally, the changes in the value of the SDR against the U.S. dollar is used as another are calculated, and the results are shown and compared with other measures in table 1 and Figure 3. According to the SDR

Figure 3



basket measure in 1974 and 1975, the U.S. dollar appeared weak; whereas, according to the other three baskets for the same two-year period, the dollar appeared strong. It should be noted that the gap between the SDR basket and the other three is relatively large in those two years. The reason for these differences id due to the currencies and corresponding weights of the currencies in them. Specifically, that results from the U.S. dollar dominating the SDR, but is not included in the Geneva I and Geneva II baskets.

The cumulative changes of the value of the dollar by the SDR basket for the whole period is a loss of 21.14 percent, an average annual loss of 1.06 percent, with a standard deviation of 5.07 percent. Note that the variation of the value of this basket is the lowest among the four composites.

Measurement of the Inflationary Impact

Equation (4) is used for the measurement of the inflationary impact on OPEC, and their results are shown in Table 1 and Figure 4. Based on this inflationary measure, the highest increase, over 24 percent, was in 1974 and the largest decline, 3.67 percent, was in 1982. For the entire period from 1970 to 1989, this index increased by an annual average rate of 7.34 percent, with a standard deviation of 8.06 percent.

Measurement of the Terms of Trade

Using equation (6) the terms of trade for the inflationary impact, measured by the trade-weighted export price index, the price of crude oil, and four different measures of the value of the dollar, are measured and shown in Table 2. Two of these measures are also shown in Figure 4. Accordingly, the largest increase in the terms of trade of OPEC, 236.5 percent, occurred in 1974 as measured by SDR basket.

While the terms of trade measured by the four baskets followed the same paths, in 1975 and 1983 there are discrepancies between the results by the SDR and those of other three. In those two years the SDR measure of the terms of trade was reduced by 2.14 and 6.13 percent respectively, while by the other three measures they improved.

The cumulative changes, C.C., annual average changes, and the standard deviation of the terms of trade of OPEC for these four measures are also shown in Table 2. These results suggest that between 1970 to 1989, OPEC improved its terms of trade by 278 percent, measured by the SDR basket. That is an annual average of 13.9 percent. For the same period the variation of the terms of trade of OPEC was between the standard deviation of 57.1 (by the SDR basket) to 58.7 percent (by the Geneva I basket).

Figure 4

Changes of Trade Weighted Export Price Index

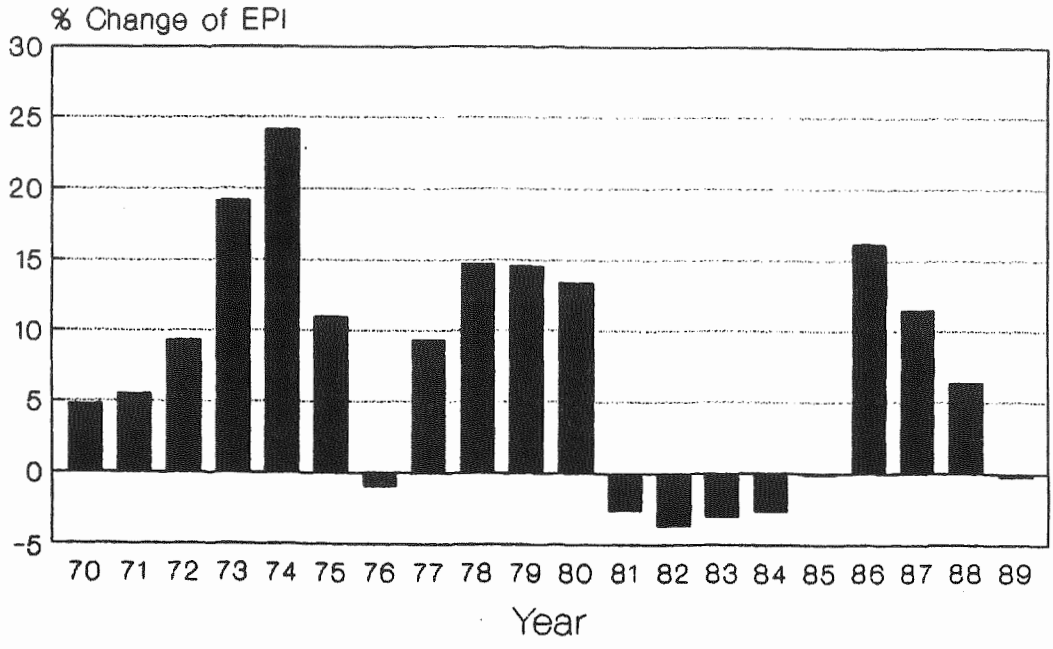


Table 2

Annual and Cumulative
Percentage Changes of the Terms of Trade
of OPEC by Four Different Basket Measures, 1970-89

Year	Genv 1		Genv 2		Trade		SDR	
	A. C.	C. C.	A. C.	C. C.	A. C.	C. C.	A. C.	C. C.
70	-3.23	-3.23	-3.51	-3.51	-3.04	-3.04	-3.21	-3.21
71	18.93	15.7	19.16	15.65	19.79	16.75	21.08	17.87
72	-2.19	13.51	-0.44	15.21	-0.17	16.58	-1.77	16.10
73	13.38	26.89	16.97	32.18	16.17	32.75	14.01	30.11
74	239.65	266.54	239.16	271.34	240.84	273.59	236.50	266.61
75	6.06	272.60	4.28	275.62	9.29	282.88	-2.14	264.47
76	9.82	282.42	8.67	284.29	8.45	291.33	13.42	277.89
77	-4.06	278.36	-3.77	280.52	-3.96	287.37	-2.73	275.16
78	-23.74	254.62	-20.7	259.82	-22.38	264.99	-19.03	256.13
79	16.01	270.63	17.02	276.84	18.44	283.43	18.28	274.41
80	52.14	322.77	52.41	329.25	52.74	336.17	52.01	326.42
81	36.74	359.51	33.27	362.52	29.88	366.05	26.33	352.75
82	21.50	381.01	18.02	380.54	17.62	383.67	13.46	366.21
83	0.42	381.43	-2.40	378.14	-4.17	379.50	-6.13	360.08
84	10.98	392.41	9.18	387.32	7.79	387.29	4.09	364.17
85	-3.28	389.13	-5.31	382.01	-4.17	383.12	-6.03	358.14
86	-89.72	299.41	-85.77	296.24	-85.69	297.43	-80.17	277.97
87	3.53	302.94	6.15	302.39	6.72	304.15	8.70	286.67
88	-31.68	271.26	-30.64	271.75	-31.94	272.21	-32.06	254.61
89	26.39	297.65	24.79	296.54	24.98	297.19	23.80	278.41
C.C.	297.65		296.54		297.19		278.41	
Avg	14.88		14.83		14.86		13.92	
S.D.	58.71		58.11		58.47		57.17	

* A. C. = Annual Change; C. C. = Cumulative Change; Avg = Annual Average; S.D. = Standard Deviation.

SUMMARY AND CONCLUSIONS

Four different baskets were used to measure the impact of changes in the value of the dollar vis-á-vis other currencies. The weak dollar of the early seventies caused a reduction in the purchasing power of OPEC against other industrial nations. On the other hand, during the early eighties OPEC gained from a strong dollar.

The impact of higher prices of goods imported by OPEC was measured by the export price index of the major industrial nations, weighted by each nation's exports to OPEC. The sharpest increase in this inflationary measure occurred in 1974, by 24 percent, and its steepest decline happened in 1982, by 3.67 percent.

Combining the effect of the strength of the dollar, the effect of inflation or deflation on OPEC as a measure of overall gain or loss to OPEC, and changes in the price of OPEC oil, the terms of trade of OPEC were calculated for 1970 to 1989. Based on these results, the largest increase in the terms of trade of OPEC was 236 percent, in 1974, and the largest reduction in the terms of trade of OPEC was 80 percent in 1986. What will happen to the terms of trade of OPEC in the future depends on changes in the price of oil, the strength of the dollar, and change in export price index of the industrial nations in the future.

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NOTES

I am grateful to an unanimous referee for his constructive suggestions. The usual disclaimer applies.

[1]For example, see Adelman (1981).

[2]For 1970 to 1984 the price of Saudi Arabian crude, and for 1985 to 1989 the Dubai bench mark are used.

[3]The terms of trade among countries reflect the impact of changes in price and exchange rates on import and export revenues. There are several measures for the terms of trade. The most widely used is called "net barter" terms of trade. According to this criterion, if trade between two countries is balanced, then by definition.

$$P_x \bullet Q_x = P_m Q_m \quad \text{or}$$
$$P_x / P_m = Q_m / Q_x$$

where P_x and P_m are the prices of exports and imports and Q_x and Q_m are the quantities exports and imports respectively. The ration of P_x/P_m is called the "gross barter" terms of trade. The higher either of the ratios is for a country, the more that country is able to import for any quantity of exports. If for the same quantity of exports, A_x, a country can import more (fewer) commodities, its terms of trade improves (depreciates), other things being constant. In this study P_x/P_m is used for the measurement of the terms of trade (TOT). The change (D) in this ratio over time is transformed into a dynamic measure as d (TOT) = %D (Price of oil as OPEC's exports)-%D (Prices of Imports).

[4]The Special Drawing Right (SDR) was created formally on January 1, 1970, by the International Monetary Fund (IMF) for the purpose of increasing international liquidity. One SDR equaled one United States dollar, and had the same fixed gold content of 0.8886 grams. The floating exchange rate system which started in 1973 caused the value of the dollar and, consequently, the value of the SDR, which was in terms of the dollar, to fluctuate widely vis-á-vis other currencies. Furthermore, the value of the SDR, which was linked to the dollar, dropped due to the depreciation of the dollar in terms of other major currencies. As a result, there was growing support to convert the value of the SDR in terms of a basket of major currencies rather than to only one currency, the dollar. It was believed that the change should make the SDR relatively "stable." Consequently, the IMF adopted the method of valuing the SDR in the market value of a basket of 16 currencies. In July 1977 two of the currencies in the SDR basket was replaced with two other currencies. In January 1981 the SDR was simplified into five currencies of the United States (42%), Germany (19%), France, Japan, and the U.K. (each 13%).